

U. S. ARMY DELIBERATE RIVER CROSSINGS: A BRIDGE TOO FAR?

**A MONOGRAPH
BY
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First Term AY 96-97

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DTIC QUALITY INSPECTED 3

19970506 026

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)

2. REPORT DATE
05 December 1996

3. REPORT TYPE AND DATES COVERED
MONOGRAPH

4. TITLE AND SUBTITLE

US Army Deliberate River Crossings: A Bridge Too Far?

5. FUNDING NUMBERS

6. AUTHOR(S)

Major John S. Morris, U.S. Army

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

School of Advanced Military Studies
Command and General Staff College
Fort Leavenworth, Kansas 66027

8. PERFORMING ORGANIZATION
REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Command and General Staff College
Fort Leavenworth, Kansas 66027

10. SPONSORING/MONITORING
AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

Distribution statement A

12a. DISTRIBUTION / AVAILABILITY STATEMENT

"Approved for public release; distribution
is unlimited."

12b. DISTRIBUTION CODE

"A"

13. ABSTRACT (Maximum 200 words)

SEE ATTACHED

14. SUBJECT TERMS

15. NUMBER OF PAGES
45

16. PRICE CODE

17. SECURITY CLASSIFICATION
OF REPORT

UNCLASSIFIED

18. SECURITY CLASSIFICATION
OF THIS PAGE

UNCLASSIFIED

19. SECURITY CLASSIFICATION
OF ABSTRACT

UNCLASSIFIED

20. LIMITATION OF ABSTRACT

UNLIMITED

ABSTRACT

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by MAJ John S. Morris, USA, 45 pages.

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The focus of the monograph is on the heavy division involved in mid to high intensity operations. The discussion begins with doctrinal definitions in the area of river crossings, to include the purpose of river crossing operations and definitions of success. The eight conditions that have historically led to success in deliberate river crossings are then identified. Historical examples from World War II and the Yom Kippur War are then examined and analyzed. Each case study is compared to the eight conditions to demonstrate the validity of these factors. Next, today's US Army doctrine, training, and available resources are presented and assessed.

The monograph concludes with a comparison of the situation in today's US Army with the conditions required historically for success. This study suggests that the US Army currently has some serious training and resource deficiencies in this area and provides recommendations to improve the Army's stance.

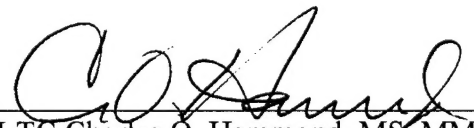
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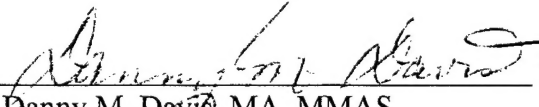
MONOGRAPH APPROVAL

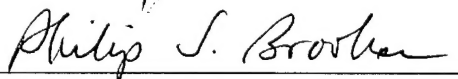
Major John S. Morris

Title of Monograph: US Army Deliberate River Crossings: A Bridge Too Far?

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Accepted this 20th day of December 1996

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I. Introduction

In January 1944, the US Army's 36th Infantry Division, opposed by portions of Germany's 15th Panzer Grenadier Division, attempted a deliberate crossing of the Rapido River in Italy, the first major US river crossing of World War II. It failed miserably, resulting in 1861 casualties over a 24 hour period. The US Army's most recent attempt at a deliberate river crossing could not be termed a resounding success either. It took the 1st Armored Division several days to create a single crossing site over the Sava River in Bosnia, opposed only by nature.¹

Compare these cases with the Egyptian Army's crossing of the Suez Canal at the outset of the 1973 Yom Kippur War, where the Egyptians forced five separate division crossings, all under fire from the vaunted Israeli Bar Lev Line, in a matter of hours.

Why were the Egyptians so successful? Why did the Americans fail? What were the keys to success and the factors in failure? Based on the answers to these questions, this monograph will assess the US Army's current capability to conduct heavy division deliberate river crossing operations. Historical examples of river crossings, successful and unsuccessful, will be presented and analyzed in order to determine the doctrine, training principals, and resources necessary for success. These findings will be compared with current river crossing doctrine, training being conducted today, and the resources available to the US Army to ascertain whether the Army is moving toward success in it's next major river crossing operation. Lastly, this monograph will suggest potential corrective actions that would increase the Army's capability to conduct these operations in today's environment.

Armies throughout history have recognized the value of incorporating rivers into their defenses. There is no reason to think that this will not continue to be the case. Overcoming this in the Army's next major attack will require a deliberate river crossing to be incorporated into the offensive.

Planning and conducting a deliberate river crossing is, arguably, far more difficult than a hasty or retrograde crossing. Therefore, this study is limited to deliberate river crossing operations at the division and corps level. Neither hasty nor retrograde river crossings will be discussed. Further, the focus will be on the heavy division, since it is far more difficult to move an armored or mechanized force across a water obstacle than any other type of force in the US Army today.

Further, this monograph assumes a moderate to high intensity combat scenario. In this scenario, US heavy forces would be opposed by a well trained foe armed with modern weaponry and determined to hold their side of the river as described in Clausewitz's second type of river defense.² Low intensity combat scenarios and operations other than war will not be discussed.

The following pages will demonstrate that the US Army today would be hard pressed to conduct even one successful division level deliberate river crossing against the foe described above.

II. The River Crossing Challenge

Force projection with an orientation on offensive operations has now replaced forward defense as the most likely major combat employment of today's US Army.³ This Army of the 1990s faces a plethora of challenges and threats. In addition to nation-building, peacekeeping, and various other operations that do not involve direct combat, today's national strategy calls for the Army to be ready to deploy, fight, and win two nearly simultaneous Major Regional Contingencies (MRCs), one in Southwest Asia and one on the Korean Peninsula.⁴ The Army also remains a major force in the North American Treaty Organization (NATO) and is likely to be involved in any NATO operation in Europe. All of these scenarios would likely involve the use of heavy forces: armored and mechanized divisions from the US Army. A close look at the map reveals that river crossings will be a part of any mid or high intensity military operation. Remember the Russians fighting their delay against the Germans in 1941, using virtually every river in the Germans' path as an anchor for their defense.⁵ The Germans did the same thing during their fighting withdrawal in the face of the allies in Western Europe during the same war. Failure on the part of the US Army to maintain the capability to conduct successful river crossing operations could result in severe setbacks and delays, or even outright failure, in the conduct of offensive combat operations.

River crossings serve one purpose: to project combat power across a water obstacle in order to accomplish a mission.⁶ US Army doctrine today describes three different types of river crossing operations: hasty, retrograde, and deliberate. A hasty river crossing, the preferred method, is simply a continuation of an attack across a river

by a brigade or higher level organization with no intentional pause at the water to prepare. These are attempted when the enemy resistance is weak. Little centralized planning or control is involved. A retrograde crossing is a movement to the rear across a water obstacle while in contact with the enemy in order to establish a defense on the exit bank. It requires centralized planning and control, essentially a reverse execution of a deliberate crossing⁷.

As stated earlier, the type of crossing operation discussed here is the deliberate crossing. This type of crossing operation is conducted when a hasty crossing is not feasible, when one has already failed, or when offensive operations are to be commenced/renewed against a strong enemy defense along the river.⁸ A division is normally the smallest organization that can conduct a deliberate river crossing, although the corps must augment them with additional resources, such as engineers, military police, smoke, and air defense units.⁹ The deliberate river crossing is characterized by extensive reconnaissance, planning, and rehearsals prior to execution. It also requires well trained units and a tremendous synchronization effort during execution in order to succeed. Deliberate river crossings must be planned and conducted as *combined arms operations*. They are not simply a case of "call the engineers". This kind of operation is not all that different from the deliberate breach of any other kind of obstacle described in US Army Field Manual (FM) 90-13-1, Combined Arms Breaching Operations: a synchronized combined arms operation under the control of the maneuver commander that is successful if the attacking unit overcomes the obstacle(s) before the enemy can counterattack in force, thereby preventing the attacking force from seizing its final

objective.¹⁰ The principles of suppression, obscuration, secure, and reduce (SOSR) still apply. Ultimately, this is a classic “fastest with the mostest” problem.

The challenges for today’s Army in the area of river crossings are clear. First, it must possess a solid doctrine, based on historical precedent. Next, it must have a force structure capable of implementing that doctrine. Third, all of the forces to be involved in river crossing operations must be trained at all levels in order for the operation to succeed.

In his 1985 study of then current river crossing doctrine, Edwin Arnold identified six conditions that were present in successful deliberate river crossings.¹¹ These factors, grounded in historical example, have not changed. River crossing operations succeed when they:

- 1) achieve surprise through deception and security,
- 2) have abundant fire support,
- 3) have friendly air superiority,
- 4) have large numbers of infantry soldiers,
- 5) construct bridges early in the operation, and
- 6) a situation where the defender conducts only piecemeal counterattacks.

Two additional conditions need to be added:

- 7) The crossing is conducted by units that have trained on river crossing operations from the individual to the division level.

8) Adequate assets are on hand to rapidly cross assaulting infantry forces (i.e. assault boats, helicopters) and the capability exists to cross follow on heavy vehicles (i.e. heavy bridging).

A good method of evaluating today's situation is by the use of history. The above criteria will be weighed against the historical cases presented in Chapters III (failure) and IV (success) to demonstrate the timeless validity of these factors. The same criteria will be compared against today's situation within the US Army (Chapter V) to analyze the validity of today's doctrine, the adequacy of today's force structure, and training readiness for river crossing operations.

III. Case Study: Failure

If the premise is that the US must be able to "get it right the first time" in the next conflict, it must be noted that history has not been kind to the US in this regard. While the US conducted many successful deliberate river crossings in World War II, there was a certain learning curve involved, one which the US cannot afford today.

The first American attempt at a deliberate river crossing in World War II occurred in the Liri Valley of Italy during 20-22 January 1944, when the 36th Infantry Division, II (US) Corps, US 5th Army attempted to cross the Rapido River as part of the Allied advance up the Italian peninsula. Holding this portion of the German's Gustav Line was the 15th Panzer Grenadier Division, which occupied extensively prepared defensive positions west of the river. These positions were situated on high ground that gave the Germans excellent observation and fields of fire against the 36th Infantry Division in the valley below. The American side of the Rapido was flat and low with scarce cover and concealment on the approaches to the river. The Rapido River, only 50 meters wide in this area, had overflowed its banks and was running very fast at this time. During daylight, the Germans could see everything near the river on both sides. Muddy fields, impassable to most vehicles, lined the American side of the river. In short, the Americans position was vastly inferior to the German's position, a poor place to conduct a river crossing¹². Furthermore, the Germans considered the 15th Panzer Grenadier Division to be the best unit that they had in Italy.¹³

The 36th Infantry Division had its three regiments, the 141st, 142nd, and 143rd Regiments, as well as its organic cavalry troop, division artillery, and engineer battalion. However, the division was short about 500 men (primarily infantry soldiers) in each of its regiments due to attrition from previous combat. II (US) Corps gave the 36th Division two more engineer battalions (plus two armored engineer companies), a tank battalion, a tank destroyer battalion, and a chemical battalion (for smoke) for their crossing attempt. With the addition of II Corps units, the 36th Division had 16 battalions of field artillery available for fire support. The XII Air Support Command, which had already achieved air superiority over the Germans, was to assist the preparation and provide close air support,¹⁴

In preparing for the assault crossing, the engineers obtained 119 plywood assault boats and 113 pneumatic assault boats, each capable of carrying 6 infantry soldiers, for the infantrymen who would assault across the river first to secure bridgeheads. Following this, engineers were to construct improvised footbridges and treadway bridges to cross additional dismounted troops and light vehicles. Finally, the engineers would bring Bailey Bridge sets up to the river and construct the bridges that would cross the division's heavy vehicles.¹⁵ All of the bridging materiel was concealed in forward stockpiles, but it was still several miles from the river's edge because of superior German observation.

The 36th Division had never trained with river crossing equipment up to this point, but two of the division's infantry regiments, the 142nd and 143rd, conducted rehearsals for the river crossing with the supporting engineers in the days before the

operation. However, this training was conducted under conditions quite different from the actual conditions at the Rapido River. Furthermore, the 141st was substituted for the 142nd at the last minute by the division commander in an effort to 'equalize the amount of combat among his three regiments'.¹⁶ Ergo, the 141st had not rehearsed or trained on river crossings at the time of the attempted crossing.

The division's plan for the river crossing called for the 141st to attack across the Rapido River north of the town of Sant' Angelo and to seize the town itself. The 143rd was to cross the river south of the town and assist the 143rd with its capture. The 142nd was to be in reserve (see Map 1). Since the Germans could see everything that the 36th did during daylight hours, the division decided to conduct the assault at night, with H-Hour at 2000 hours on 20 January 1944. The attack was to be preceded by a 30 minute artillery preparation.

The artillery preparation went off as planned, but by 2000 hours the troops who had to carry the crossing equipment from their stockpile locations to the planned crossing sites were still not near the river. The Germans were ready. Their artillery, which now responded to the allied preparation, fired down into the flats, their shells falling amidst American infantrymen carrying the boats and footbridges. The muddy terrain made it impossible to carry bridging equipment forward on trucks. At least 25% of the boats and footbridges were lost almost immediately, having been damaged, destroyed, or simply abandoned. Part of the trouble was the inexperience of the infantrymen in carrying the equipment, partly due to the lack of forceful leadership in small units. By the time the first wave of troops reached the river, approximately half of the crossing equipment was

beyond use. Most of the rubber boats were unusable after being hit by shrapnel.

Plywood boats with holes were placed in the water and sank, sometimes carrying heavily loaded infantry with them.¹⁷ Additionally, engineers could not put infantrymen across the river. Despite the engineers urging, the infantry had no will to go¹⁸. The lack of familiarity of one branch with the other's techniques and equipment provoked these misunderstandings.¹⁹

Despite all these setbacks, both regiments did manage to get a small number of infantrymen to the far shore, where they established shallow bridgeheads. The engineers then attempted to construct footbridges for infantry and treadway bridges for vehicles, but German artillery had not been suppressed by counterbattery fire. The engineers managed to build one footbridge from the pieces of several damaged by fire at 0400 hours on the 21st, but this bridge was destroyed about an hour later. The vehicular bridge that was to have been installed could not even be started due to the German artillery.²⁰ As daybreak (and the increased accuracy of German fires) approached, the lone footbridge was destroyed. The division ordered the battalions on the near shore to withdraw to their assembly areas. The few troops remaining alive on the far shore were told to dig in and await assistance. Most of them were not to be found later. This entire attempt at crossing the river did not even provoke alarm within the 15th Panzer Grenadier Division. No counterattack by the division reserve was even required.

The 36th Division tried the same plan again later on the 21st of January. Under cover of smoke, the 143rd Regiment succeeded in putting three rifle companies across the river by 1830 hours. A footbridge was then constructed and the rest of the

battalion crossed, but they could only advance about 500 yards. The 141st Regiment's second attempt did not get going until 2100 hours, but they too had some initial success in trying to reinforce the few remaining men in the bridgehead established earlier that morning, getting most of their assault force over the river by 0400 hours on the 22nd of January. What was needed was tank reinforcement, but the bridges needed to cross these vehicles could not be brought forward, let alone installed due to German small arms and artillery fire. By early afternoon on 22 January, when fog lifted and visibility improved, German artillery again found the mark and destroyed all of the boats and footbridges that remained at the crossing sites.²¹ At 1600 hours, the 15th Panzer Grenadier Division counterattacked the small bridgeheads with approximately two companies, followed by another small counterattack one hour later. By 1900 hours, about 40 soldiers from the 36th Division returned to the near shore: all the rest had been killed, wounded, or captured. On 23 January 1944, the 36th Division assumed a defensive role as the 34th Division prepared to cross the Rapido farther north. Their Rapido River experience was over.

Analysis

An assessment in the context of the eight conditions required for success shown in Chapter II shows why this operation failed. The following paragraphs demonstrate that poor performance in all eight areas is not necessary in order to produce failure.

The place chosen for the attack, the Liri Valley, was a major factor in this disaster. The 36th Division had absolutely no chance for surprise, deception, or near shore security. The Germans, occupying the high ground on the far shore, could observe

and hear just about every movement made by the 36th Division, day and night. Besides the commanding position in terms of height, the last two miles on the near shore approaches to the river were void of cover and concealment for troops as they approached the river. Since the division could not physically occupy the terrain all the way up to the river itself due to German overwatch, they could not even secure these near shore approaches prior to the attack. After US engineers had cleared paths through the German minefields in the days leading up to the attack, the Germans were able to go back in and reseed these minefields at night. Much confusion and many US casualties were the result during the actual attack.

Although the 36th Division had a large amount of artillery in support for the operation, its effects were generally not felt after the initial preparation. Maximum use of the II Corps Artillery in support of the division was impossible. The German artillery was generally silent prior to the conclusion of the friendly artillery preparation, masking their firing positions. Since smoke hung over the low areas occupied by the Americans, their visual acquisition of German artillery and infantry targets was largely unattainable. The Americans were relegated to locating artillery targets by sound ranging, a difficult proposition in the noise of a large scale battle. The Germans moved their artillery frequently, making it even harder to acquire. Even though the 36th Division had superiority of numbers in artillery, its effect was diminished by the German tactics and the terrain as noted above.²²

Air supremacy was not a problem for the 36th Division. The XII Air Support Command flew 124 sorties in support of II Corps on 20 January 1944. Documentation of

this battle makes no mention of any German air activity during the period 20-22 January 1944.

A third problem for the 36th Division was the shortage of infantrymen noted earlier in this chapter. In a deliberate river crossing such as this one, infantrymen are required to spearhead the assault by crossing the river, then seizing and holding a bridgehead large enough to eliminate direct and observed indirect fire on the crossing sites while engineers construct bridges. Because these infantrymen cross the river without tanks, artillery, etc., they are subjected to high casualty levels at the hands of the defending enemy. Therefore, these infantry formations must have large numbers in order to sustain the fight until bridges can be constructed and heavy reinforcements arrive. In the case of the 36th Division, the depletion of infantry soldiers in battles prior to this one was felt when the regiments were almost completely attritted on the far shore before engineers could build bridges to cross heavy weapon systems.

The 36th Division did plan to construct bridges to cross these heavy vehicles early in the operation. The engineers did attempt to construct these bridges, even though the crossing sites were still under direct and observed indirect fire. However, the superiority of the German artillery fires and difficulty of the terrain precluded successful construction of the bridges. The large number of casualties at the crossing sites attest to the fact that the effort was made, however futile.

Despite their apparent lack of immediate success, German counterattacks on 22 January 1944 proved to be the straw that broke the camel's back. Although this was a German action that could not be directly controlled by the Americans, the 36th Division

was unable to do much to break up these counterattacks. No plan had been made to deal with counterattacks and neither the XII Air Support Command nor the II Corps Artillery was able to intercede.

Another major shortcoming for the 36th Division was the lack of training on river crossing operations prior to this operation. The 36th Division, despite being considered the best trained division in II Corps at the time, had no satisfactory experience with the equipment, tactics, or combined arms training.²³ Even the training that was conducted just before 20 January 1944 was unsuited to the task at hand. The 36th Division had never been involved in a deliberate river crossing operation. The tremendous amount of coordination both before and during execution demanded that the division and regimental staffs conduct some kind of training in view of the dearth of experience, but they had not done this. This shortcoming manifested itself in this case in the poor coordination displayed during execution. Ironically, Fred L. Walker, the 36th Division's Commanding General, was not inexperienced in this area. When he was a battalion commander, he had played the part of defending against German units attempting to cross the Marne River during World War I, with his battalion doing exactly the same as what the Germans did to the 36th Division in 1944.²⁴

At first glance, the 36th Division seemed to have ample river crossing assets at its disposal for the operation. With the assault boats at hand, they could theoretically cross over 1200 infantrymen in a single assault wave; however, several of the factors noted above precluded that. A far more pressing problem for them was the number of footbridges (4), treadway bridges (2), and Bailey bridges (1) available.²⁵ The 36th

Division plan did not plan for a “fudge factor” when it came to the bridging assets required to rapidly cross the heavy weapon systems and infantrymen required to hold the meager bridgeheads. When these bridging assets began to be attrited by German fire, an entirely predictable event, the 36th Division lost its capability to reinforce the bridgeheads. Their fate was sealed.

IV. Case Study: Success

Compare the US blunder at the Rapido River with the Egyptian Army's deliberate crossing of the Suez Canal in the Yom Kippur War during the period 6-7 October 1973. The Egyptians successfully crossed five divisions against the Israelis, to include ten heavy brigades, in approximately eighteen hours.

The Israelis, who were occupying the entire Sinai Peninsula following their overwhelming victory in the 1967 war with Egypt, had decided to take advantage of the natural barrier provided by the Suez Canal. They constructed a series of concrete fortresses (about thirty in all) along its 160 kilometer length. This became known as the Bar Lev Line. These fortresses, the Israeli first line of defense and manned by one infantry brigade, were designed to be early-warning posts in the event of an Egyptian attempt to cross the canal (see Map 2).²⁶ The Israelis also incorporated the canal itself into their defensive plan. The canal, ranging in width from 195-220 yards and 16-18 meters deep, had been lined with concrete walls that extended 3-9 feet above the water line, depending on the tide. This prevented the use of amphibious vehicles or floating bridges by the Egyptians until this barrier had been reduced at each crossing site. The Israelis also raised the height of the sand berm on their side of the canal, creating a barrier right at the water's edge that was approximately 60 feet high, 60 feet thick at the base, and with a bank slope of 45-60 degrees. This would prevent Egyptian vehicle egress until it too was reduced. The Israeli fortresses sat atop this berm, able to overwatch the entire front and to sweep it with machine gun and anti-tank fire. Deep inside the sand rampart the Israelis embedded reservoirs filled with flammable liquid.

Outlets to the canal were controlled by the forts, who were able to flood areas of the canal's surface at likely crossing sites, turning it into an inferno. Lastly, they constructed tank firing positions every 100 meters along the top of the rampart for the tank brigade that was able to reinforce within one hour.²⁷ The Israelis defensive plan, predicated largely on advance warning of an impending Egyptian attack, called for one tank brigade (120 tanks), acting as the second line of defense and located 3-5 miles behind the canal, to occupy the prepared positions on the rampart at the crossing points within 30-60 minutes of an Egyptian attack. The third line, or reserve, was two tank brigades approximately 20 miles to the east of the canal. Their mission, aided by the Israeli Air Force, was to counterattack the Egyptian main effort, throwing them back across the Suez Canal. If this failed, then the Israelis would mobilize their reserve and implement another plan.²⁸ The Egyptians knew all of this.²⁹

The Egyptians planned to employ five infantry divisions, each reinforced with two heavy brigades and large numbers of portable anti-tank weapons, in the attack on the Bar Lev Line. These forces were divided into two armies, the 2nd and 3rd Armies.³⁰ All told, the Egyptians would employ some 80,000 troops, 500 tanks, and 11,000 vehicles in the river crossing.³¹ Included in this number were over 30,000 infantrymen taking part in the assault.³² Over 2000 artillery pieces were massed for the crossing.³³ Some 15,000 engineers, organized into 35 battalions, were to support the attack.³⁴ To counter the dominance of the Israeli Air Force, large numbers of mobile surface-to-air missiles (SAMs) were on hand to create a dense belt of air defense, providing close-in protection to the crossing effort. Additionally, the assaulting infantrymen carried "every portable or

draggable . . . anti-aircraft weapon they could manage.”³⁵ Over 200 Egyptian aircraft were available for crossing support and deep attacks.³⁶

During the preparation for the assault, the Egyptians pulled together all of the engineering assets required to accomplish the following within the first five to seven hours of the assault:

- Crew 720 rubber boats for the initial assault.
- Build 10 pontoon bridges for follow-on infantry crossings.
- Open 70 vehicle passages on the far shore for vehicle egress.
- Build and operate 35 ferries.
- Construct 10 heavy bridges for tanks and heavy equipment.
- Construct 5 light bridges.

All of the equipment required for the above was stockpiled forward prior to the attack, very near to the canal but out of the view of the Israelis occupying the Bar Lev Line.

The Egyptian Army conducted planning and training at all levels in the months prior to the attack, all under conditions and terrain similar to that along the Suez Canal and the Bar Lev Line. Engineers practiced opening passages through large sand ramparts with high-pressure water pumps, operating assault boats, and constructing bridges. Infantrymen participated in the training with the engineers, assaulting across the water obstacle in boats and scaling the rampart on the far shore.³⁷ In short, engineers and infantry were familiar not only with each other, but also with the tactics, techniques, procedures, and equipment to be used in the assault. Much time and effort was devoted to leader development in the months, even years, prior to the attack.³⁸

The river crossing portion of the Egyptian attack was incredibly detailed and well thought out. In order to gain surprise on the Israelis, engineers worked to ensure secrecy in the planned approach areas by constructing a large sand rampart of their own on the Egyptian side of the canal. This hid troop and equipment concentrations. Engineers also left certain projects unfinished to give the appearance of unreadiness. Egyptian soldiers were told the day prior to the attack that it was only an exercise.³⁹ This helped ensure operational security. Conflicting statements by Anwar Sadat probably aided strategic surprise⁴⁰. Lastly, the attack was planned to jump off during Yom Kippur, a Jewish holiday, when the Israelis were likely to be less alert than normal.

Fearing Israeli air strikes, the Egyptians planned to cross the canal on a wide front. Following a 30 minute artillery preparation aimed at the Bar Lev fortresses, coupled with attacks by Egyptian aircraft against deep targets, each of the five infantry divisions would assault across the canal in rubber boats in twelve waves at 15 minute intervals, creating five separate bridgeheads containing a total of 48,000 men within three hours. The infantrymen in these bridgeheads were to defeat the anticipated counterattack by the first Israeli tank brigade located just east of the canal and to neutralize or destroy the fortresses along the Bar Lev Line. Engineers would simultaneously begin knocking egress holes in the rampart on the far shore. After the passage of the assault waves, pontoon, heavy, and light bridges (to include dummy bridge sites) would be constructed to allow heavy weapons and vehicles to cross the canal prior to the arrival and counterattack by the other two Israeli tank brigades located farther to the east. All of this activity was to be protected from Israeli air attacks by

mobile SAM units moved forward along the canal and by the infantry with their shoulder fired SAMs. The Egyptian objective for the crossing portion of the attack was to have five bridgeheads with a depth of five miles by H+24. By H+48, these bridgeheads were to be consolidated into two Army level bridgeheads to a depth of nine miles east of the canal.⁴¹ These units would then dig in and assume the defensive to destroy Israel's mobilized reserves. Apparently the Egyptians had read Clausewitz!

H-Hour was set for 1430 hours on the 6th of October, 1973. At 1400 hours, the artillery preparation and air strikes began. Engineers paddled across the canal to check that all of the flammable liquid outlets had in fact been blocked by Egyptian Special Forces the night before. At 1420 hours, 720 rubber boats carrying 4,000 Egyptian infantrymen splashed into the Suez Canal. This first wave landed at 1430 hours, scrambled over the rampart, and deployed to engage Israeli tanks and begin reduction of the fortresses.⁴² The Israelis were caught by surprise.⁴³

Waves two through twelve crossed the canal on schedule, aided by an innovative system of markers for sites, equipment, and soldiers. They were largely unimpeded by Israeli direct and indirect fire. The Israeli Air Force attempted to interdict crossing sites at 1500 hours, but lost four planes in the process. They tried again at 1600 hours with similar results. By 1730 hours, all twelve waves were across the canal.

Meanwhile, by 1630 hours Egyptian engineers were beginning assembly of rafts and bridges at the canal. Dummy bridges successfully diverted some Israeli pilots from the real bridges.⁴⁴ By 1800 hours the first Egyptian tanks were rolling from their assembly areas toward the canal, with the first units crossing at about 1830 hours. By

2230 hours, less than eight hours after the assault started, all of the planned bridges were open except for three in the southern sector that are mired in mud.

By 0800 hours on 7 October 1973, the Egyptians had won the crossing battle. It was the “largest first day crossing in world military history”.⁴⁵ Within the three Israeli armored brigades and one infantry brigade defending the Bar Lev Line, over 300 of their 360 tanks had been destroyed and thousands of Israeli soldiers had been killed. Numerous Israeli planes had been lost. The Egyptian losses were 5 aircraft, 20 tanks, and 280 killed during this period.⁴⁶ The Israelis had been handed perhaps their worst defeat ever. Although the battle raged on and the Israelis eventually won the war, the Egyptian river crossing story ends here.

Analysis

This operation by the Egyptians clearly demonstrates the importance of the eight “success” conditions from Chapter II.

Surprise was clearly a major contributor to the Egyptians’ success. As discussed above, the Egyptian’s went to great lengths to deceive the Israeli’s as to their intentions and their capabilities. The Israelis misconstrued what they could see (incomplete preparations, dummy bridges, etc.), but more importantly the Egyptians fooled them with what they could not see. Good security contributed greatly to their deception plan. Unlike the 36th Division in the first case study, the Egyptians secured their side of the canal all the way up to the water’s edge, thwarting the Israelis’ ability to infiltrate any substantial ground reconnaissance on the west side of the canal, denying them a true picture of the buildup. The Egyptians also denied the Israelis information from air

reconnaissance. Starting in 1970, with the help of Soviet equipment personnel, the Egyptians were able to close the airspace all around the crossing areas to Israeli air reconnaissance.⁴⁷ Thus, the Egyptians had almost perfect intelligence on Israeli dispositions and capabilities, while the Israelis had a picture that was far from accurate.

The Egyptians made good use of the large numbers of artillery pieces available to them. The artillery's fire support task was greatly aided by the intelligence picture noted above. In the first minute of the preparation, over 10,500 shells fell on the Bar Lev Line at the rate of 175 shells per second.⁴⁸ The Egyptians were able to plan not only the preparation, but subsequent fires as well. Many of the guns were even used in direct fire mode against the fortresses along the Bar Lev Line after the initial preparation. Later in the attack, when fires were shifted to deeper targets to disrupt Israeli counterattacks, forward infantrymen (as planned) acted as forward observers, calling in deadly fire to disrupt the Israeli formations.⁴⁹

Countering the supremacy of the Israeli Air Force was probably one of the biggest challenges for the Egyptians. They had seen firsthand how decisive Israeli air could be in the 1967 Arab-Israeli War. With a marginal Air Force of their own, the best that they could hope for was to neutralize the Israelis to the point where they did not seriously disrupt the crossing. The Egyptians accomplished this by creating the dense air defense net noted above with Soviet made SAMs. It worked: the Israeli Air Force suffered terrible losses in the early part of the war. The Egyptian Air Force also enjoyed some success with deep strikes during the crossing portion of the war, losing only five aircraft up until 0800 hours on 7 October 1973.⁵⁰

Dismounted Egyptian infantry on the far shore, equipped with anti-tank weaponry, was required to fend off armored counterattacks early in the battle. They had to hold off these tanks until bridges could be built and Egyptian armor could move up. Even with these anti-tank weapons, large numbers of infantry were required. Unlike the 36th Division, the Egyptians recognized this and built their whole plan around infantry divisions with huge numbers of infantry soldiers, then reinforced those divisions with armored formations. As a result, these infantry soldiers were able to withstand counterattacks and virtually destroy the Israeli first echelon tank brigade and part of the reserve before being reinforced by Egyptian tanks.

One key aspect of the Egyptians' plan was to construct bridges very early in the crossing operation. Because these bridges were in place, some as early as H+4, Egyptian armor and other heavy equipment was arriving on the far shore to reinforce the infantry very early in the battle. Given the massive amount of engineering work required just to prepare the near and far shore banks prior to any bridge construction, this feat was truly incredible. Without these bridges and the armor that they provided to the east side of the canal, Egyptian infantry losses undoubtedly would have been far greater, perhaps even prohibitive despite the large number of infantry soldiers.

Although not directly attributable to Egyptian actions, the Israelis contributed to the magnitude of their failure with their piecemeal counterattacks. As Chaim Herzog, an Israeli, admits:

“... the principal error was in not deciding early on, as Col. Dan requested, whether or not the armoured reinforcements were to concentrate on linking up with the fortifications or on repelling the Egyptian crossings. The correct picture of events along the Canal was out of focus until the morning of Sunday, 7 October. But by that time the

repeated armoured attempts to link up with the fortifications had cost some two-thirds of Albert's armoured force. This indecision proved to be costly."⁵¹

The Egyptians' skill in planning and executing the crossing threw the Israeli's off their plan, contributing to the confusion that led to a piecemeal Israeli response.

Extensive field exercises and rehearsals prior to the actual attack removed glitches and reduced friction. In addition to the engineer-infantry training mentioned above, other members of the combined arms team participated in these training events. For example, military police, who would be responsible for traffic control, worked with the engineers in advance so they would know and understand the elaborate road system created to move troops and vehicles rapidly to the canal.⁵² An operation as complex as this would have had no chance of succeeding with any appreciable amount of friction present: things had to go pretty much as planned.

Lastly, the Egyptians had plenty of bridging assets on hand to perform the crossing. Using backwards planning, they meticulously determined what they needed at each crossing site in order to stay on their timeline to have tanks on the far shore in time to defeat Israeli counterattacks, to include wastage factors for enemy damage to bridges and battlefield friction. Once they had those figures, they refined the plan to make sure that the vast majority of those assets arrived intact at the canal and that they survived once installed. Many installed bridges were damaged by Israeli fire but rapidly repaired, much to the amazement of the Israelis.⁵³

The Egyptians got all eight of the "success" factors right in 1973.

V. Army Doctrine, Training, and Resources Today

A good method of analyzing today's US Army doctrine, training, and resourcing is to do so within the context of the historical criteria for success in river crossing operations. Here, each area will be individually compared against the conditions that have historically led to success. The following paragraphs demonstrate that, while doctrine is generally sound, problems exist in today's force structure and training.

Doctrine

When Arnold discussed river crossing doctrine in 1985, he was discussing the 1978 version of FM 90-13, River Crossing Operations. The current version of FM 90-13 is dated 1992. While Arnold found fault with several parts of the 1978 version, he did not analyze the doctrine in the context presented here.⁵⁴ However, his comments were germane and most (if not all) of his criticisms have been addressed in the 1992 version. Of the eight "success" conditions under discussion, Arnold's first five are applicable to today's doctrine for deliberate river crossings.

The first condition historically required for success is surprise. Today's FM 90-13 lists surprise as one of the crossing fundamentals, those six attributes that must be a part of any river crossing plan. The manual emphasizes the value of a sound deception plan "that employs reconnaissance, site preparations, force buildup, and preparatory fires at a time or location other than the intended crossing area . . .", stating further that this may delay an effective threat response to the true crossing(s).⁵⁵ The current doctrine also stresses effective operations security (OPSEC) as a subset of surprise. The need to

conceal equipment and crossing preparations, as well as noise, light, thermal, and electromagnetic discipline enforcement are all addressed.

Arnold's second, third, and fourth conditions, the availability of abundant fire support, air superiority, and large numbers of infantry within the Army as a whole are really force structure issues. However, the effective employment of these are doctrinal issues.

Concerning field artillery, the Corps' organization for combat and the targeting process need to be addressed in doctrine. Current doctrine falls short when it comes to organization for combat. There is no mention in FM 90-13 about the need for Corps to provide additional artillery units to augment the division's organic artillery.⁵⁶ Today's heavy division has only three organic 155mm self-propelled howitzer battalions and one Multiple Launch Rocket System (MLRS) battery. This cannot be accurately termed "abundant fire support" in an attack against an entrenched enemy. Besides suppressing enemy direct fire positions and isolating the bridgehead from enemy counterattack (a factor in Arnold's sixth condition), "counterbattery fire is imperative to the success of the river crossing⁵⁷." Without corps artillery augmentation, it is doubtful that divisional artillery can meet all of these requirements.

The doctrine is good, however, on the employment of fire support. It states that the Division Main Command Post (DMAIN) "controls deep fire assets to isolate the bridgehead" and that, as units advance, "deep fires shift to subsequent targets" to screen the flanks and interdict threat counterattacks.⁵⁸ Elimination of threat indirect fires on the crossing sites through conterfire is also noted as a priority. There is good detail

concerning the initial preparation prior to the assault crossing by the dismounted infantry and the need for obscuration by smoke rounds is emphasized. These are exactly the things that fire support needs to do to support a river crossing operation.

The doctrine for Close Air Support (CAS) and Air Interdiction (AI) follows the same line in FM 90-13.

When it comes to Arnold's fourth condition, the employment of infantry in the assault phase of a river crossing, the main question is this: Does the doctrine provide for large numbers of infantry on the far shore to hold the bridgehead until the arrival of armored vehicles? FM 90-13 calls for initial assaults by dismounted infantry battalions to secure lodgments on the far shore. It goes on to state:

"The assaulting task force normally has three dismounted infantry companies of three infantry platoons each to conduct the assault. ... all assault companies must retain adequate dismounted infantry strength for the assault. The first wave of the assault consists company flotillas crossing on line".⁵⁹

So doctrine does answer the question in the affirmative. However, as shown later, the ability to "retain adequate dismounted strength" may be easier said than done.

A follow-on question is related to Arnold's fifth condition concerning the early construction of bridges in a river crossing: Does the doctrine call for the arrival of armored vehicles on the far shore as soon as possible to reinforce the infantry? Again, FM 90-13 emphasizes historical lessons learned by stating "Rapid reinforcement of dismounted assault troops with armored is so critical that it justifies the use of any expeditious method . . .".⁶⁰ Clearly, today's doctrine emphasizes the early construction of

bridges and/or rafts in order to get heavy weapon systems to the far shore in order to reinforce the bridgehead.

Training

The seventh condition for success requires the availability of trained units from the individual to the division level. As mentioned in Chapter II, deliberate river crossings must be planned and conducted as *combined arms operations*. Here is what the Army's basic training doctrine has to say about combined arms operations:

“Today's Army doctrine requires combined arms and services teamwork. When committed to battle, each unit must be able to execute combined arms and services operations without additional training or lengthy adjustment periods. Combined arms proficiency develops when teams train together . . . In short, the maneuver commander, with the assistance of higher-level leaders, must forge the combined arms team.”⁶¹

Today's Army leaders must be innovative in order to make this idea a reality. Nobody denies that the infantry can shoot, tank platoons can maneuver, engineers can build bridges, or that military police can direct traffic. However, even the finest orchestras in the world practice together. For several reasons, it is impractical today for divisions to conduct field training exercises with all of their organic troops and equipment at once, let alone with the addition of their “corps slice.” In practice, actual field training as a “combined arms team” is feasible only up through the brigade level, and even then field training at this level is infrequent. At the division and corps level combined arms training is conducted primarily by using computer simulations. Problems exist in both combined arms field training for units and simulation training for commanders and their staffs.

Combined arms field training for deliberate river crossings at the brigade level and below suffers neglect for a variety of reasons. First, the recent drawdown shifted many of the engineer units required for river crossing operations from active duty to the reserve component. This made a bad situation worse. Today, many major Army posts that are home to heavy maneuver units no longer have assault float bridge companies and/or the corps combat engineer battalions to conduct training with these maneuver units. Heavy brigades at Forts Carson, Riley, Stewart, and Lewis fall into this category. None of these posts has an assault float bridge company and only Fort Lewis among them has a corps combat engineer battalion.⁶² This problem surely exists within other combat support branches as well. In today's environment of shrinking budgets, transporting these types of units from other posts periodically for river crossing training is not feasible. This is not such a huge problem for units in Germany or Korea. Each of these areas still has at least one of each type unit.

The availability of training areas for battalion and brigade sized exercises is also a problem. Neither the National Training Center (NTC) in California or the Combat Training Center (CTC) in Germany, the Army's primary training grounds for heavy units, have water obstacles available for river crossing training. Terrain and unit locations have been a chronic training problem for units in the reserve component, regardless of the drawdown, where so much of the combat power expected to be available for the next MRC exists. Unlike the active duty forces, where most or all of a division is located in one place, reserve component units tend to be spread across a wide area. Their opportunity to conduct any kind of combined arms training with the other

units that they would go to war with is almost nil. If the quote from FM 25-100 at the beginning of this section is true, there will not be time to conduct a “train up” to build the team.

In today’s busy environment, competing priorities also have an impact. Perhaps some of the problem is related to a doctrinal shortfall. Mission Training Plans (MTPs) for the mechanized infantry platoon, company, battalion, and brigade, training documents that outline the task, conditions, and standards for virtually all types of training events, make no mention of river crossings whatsoever. The only MTP that outlines any tasks, conditions, and standards for river crossings is ARTEP 5-145-31-MTP, Mission Training Plan for the Engineer Company (Heavy Division)⁶³. Ironically, doctrine calls for corps, not divisional, engineers to support the assault phase of deliberate river crossing operations. A review of Corps and division level MTPs end with the same result. There are no MTP tasks for river crossing operations at either level. No MTP task means no visibility. Corps and division level staffs also wrestle with the priorities issue, perhaps even more than lower level units.

As stated, corps and division staffs train on combined arms operations primarily by utilizing computer simulations. The Army has institutionalized this training in a program called the Battle Command Training Program (BCTP). Each corps and division in the Army participates periodically by undergoing what is known as a Warfighter Exercise, a Command Post Exercise (CPX) administered by the BCTP staff. Corps and division commanders determine their own training objectives and provide them to the BCTP, who designs the exercise around those objectives. A review of those training

objectives exposes that, for whatever reasons, corps and division commanders rarely designate river crossings of any kind as a training objective for their exercises.⁶⁴ Of 23 corps and division exercises that were conducted over the last five years reviewed by the author, in only two exercises did the commander designate conducting a river crossing as a training objective. Only 7 of these exercises contained a scenario where crossing a river of any kind was included. In fairness, commanders may have believed (as does the author) that the Corps Battle Simulation (CBS), the simulation program used by the BCTP, does not “play” river crossings particularly well, giving the commander and staff unrealistic feedback in the area of river crossing operations.

Resources

The eighth condition for success is a force structure issue. Current force structure and Tables of Organization and Equipment (TOEs) determine whether or not the Army possesses adequate assets to cross assaulting infantry force and the capability to cross follow-on armored vehicles. The effect of the engineer force drawdown in the 1990s on unit training has already been discussed. If the next MRC happened tomorrow, would the Army have the crossing assets it needed?

In the Egyptian case study, there were over 30,000 infantrymen within the five assaulting divisions. This worked out to approximately 6,000 infantrymen per division. In contrast, each company in a full-strength mechanized infantry division in the US Army today can field only 54 dismounted infantrymen.⁶⁵ This works out to just over 1,000 dismounted infantrymen per mechanized division, about 20% of what the Egyptians employed. The situation in an armored division is even more dismal. Since it

has one less infantry battalion than a mechanized division, it can field less than 900 dismounts. Clearly, a shortage of infantry exists.

The corps assault float bridge company (or Ribbon Bridge company) is the engineer bridge unit that constructs rafts and bridges to cross armored vehicles in a deliberate river crossing operation. At this writing, there are only four of these companies remaining on active duty; one in Germany, one in Korea, and two in the US.⁶⁶ Since doctrine calls for two of these companies per lead brigade in a deliberate river crossing, one division attacking with two brigades abreast could conceivably require all of the active duty bridge companies in existence today.⁶⁷ There are thirteen more in the reserve component, but most of them are not required to be ready to fight until 60 to 90 days after mobilization starts. These facts could severely limit options and courses of action available to the Army in a MRC.

The shortage of infantry somewhat mitigates another potential problem by reducing the number of assault boats required in the force structure. The standard assault boat in the US Army is the RB15. It is designed to carry the 3 engineers that operate the boat and up to twelve assault troops. Twenty seven RB15s are authorized in each corps Assault Float Bridge Company. Twenty one are authorized in each corps Medium Girder Bridge Company.⁶⁸ If, in fact, an attacking brigade had two assault float bridge companies in support, it would have the capability to cross 648 dismounts in one assault wave. Even if the brigade was a “pure” mechanized infantry brigade, an unlikely scenario, it could cross all three infantry battalions at once. However, any shortage of assault float bridge companies, a highly likely scenario, would create a corresponding

shortage of RB15s. This shortage could possibly be offset by using helicopters to air assault some or all of the dismounted infantry to the far shore, if the corps would supply the helicopters. Given the air defense weapons of today and the vulnerability of the helicopter, this is a risky proposition at best.

VI. Conclusion

The US Army appears to be teetering on the brink of potential failure because today's training and force structure, when analyzed in a historical context, do not support today's doctrine. What can be done to improve the picture? The following suggestions may not solve all of the problems, but they do promise to improve the situation.

Although doctrine is generally sound, one small improvement could be made. FM 90-13 should be updated to include an emphasis on the need for the corps to augment the division's organic fire support for any attempt at a deliberate river crossing. The integration of overwhelming fire support is vital to success. As stated in US Army FM 100-5, Operations, commanders

“fight much of their fires through the function of fire support, because much of the combat power of fires is not from within their chain of command but from external resources.”⁶⁹

This being the case, details need to be given on planning the correct organization for combat for artillery units provided by the corps. Army air and Air Force support should also be more specifically addressed in the manual.

Second, combined arms field training can be improved. Infantrymen, engineers, military police, along with the others involved in this type of operation need to train together now, despite the problems with unit locations and types noted in Chapter V. With a little coordination, the units needed to fill out the “river crossing team” for training could come from the reserve component when they conduct their two week annual training each year. This could be a win-win situation. Reserve components units would get an opportunity to conduct combined arms training that they are not getting

right now. Active duty maneuver brigades and battalions would get to train with engineers and others that would not otherwise be available. In a “come-as-you-are” combat situation, time will not be available to conduct training or extensive rehearsals. The bulk of the training must be accomplished beforehand.

Third, doctrinal publications for heavy maneuver units need to be updated to include tasks related to river crossings. MTPs for the infantry platoon and/or company need to include the tasks, conditions, and standards for their portion of a river crossing that involves dismounted assault across the river in RB15s. MTPs for brigade, division, corps must include tasks, conditions, and standards for planning and controlling river crossings. This would help get away from the “call the engineers” mentality by bringing into focus what a river crossing really is: a *combined arms operation* planned and conducted by maneuver forces.

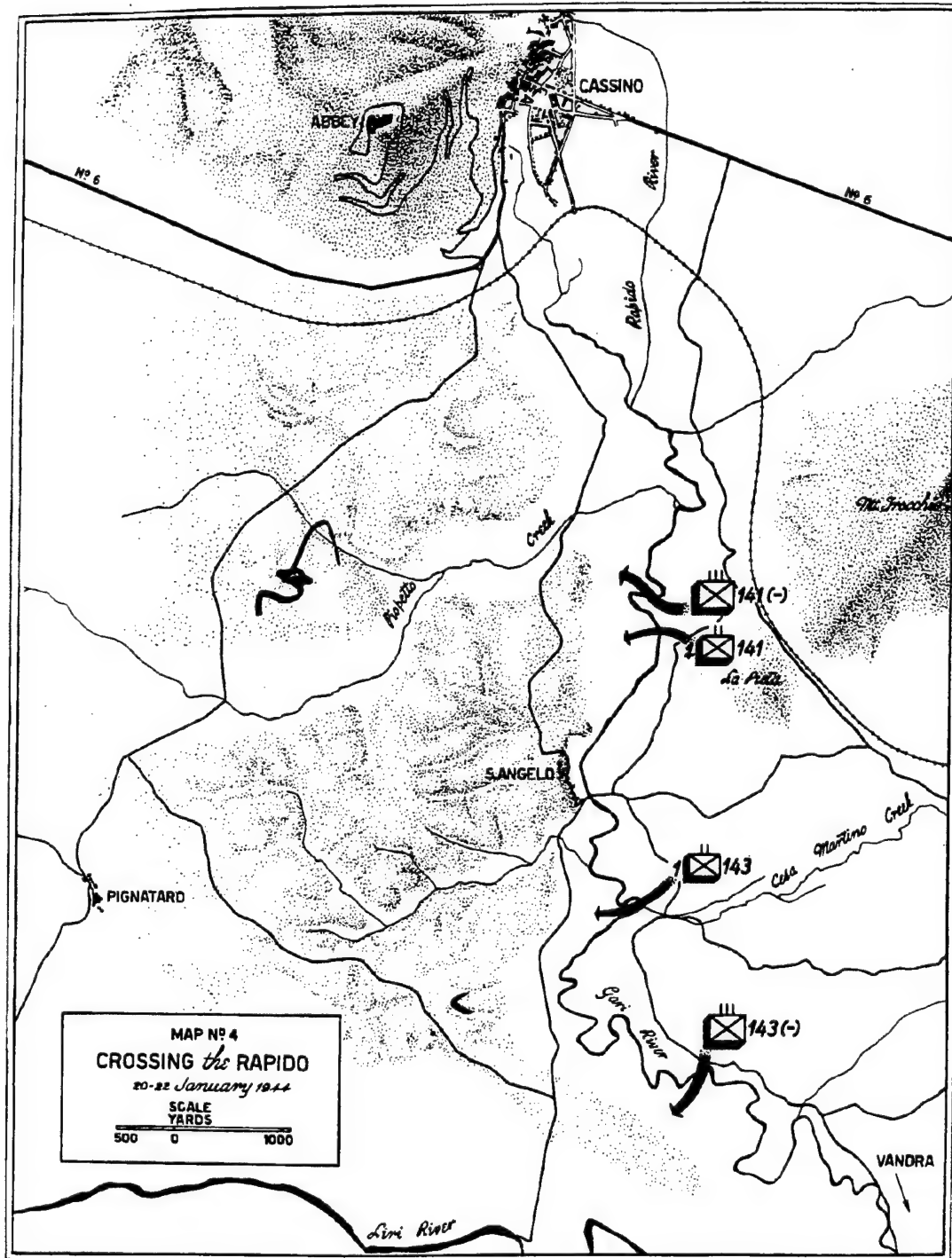
Fourth, the problem with the shortage of dismounted infantrymen available must be recognized and addressed. One option is to change the force structure to include more infantrymen in each mechanized division. However, in today’s zero sum game environment where this increase would have to come at the expense of some other branch’s force structure, this is not likely to occur. A second option is to plan on supplementing heavy divisions with light infantry units when a deliberate river crossing is called for. While this would definitely be a problem solver, these light infantrymen would need to train with their heavy brethren. Doctrine would also need to be updated to include this concept of light infantry augmentation. A third option would be to adopt a completely different doctrine; one that does not require large numbers of dismounted

infantrymen. However, history does not support the adoption of this tack. The second option is the most feasible right now.

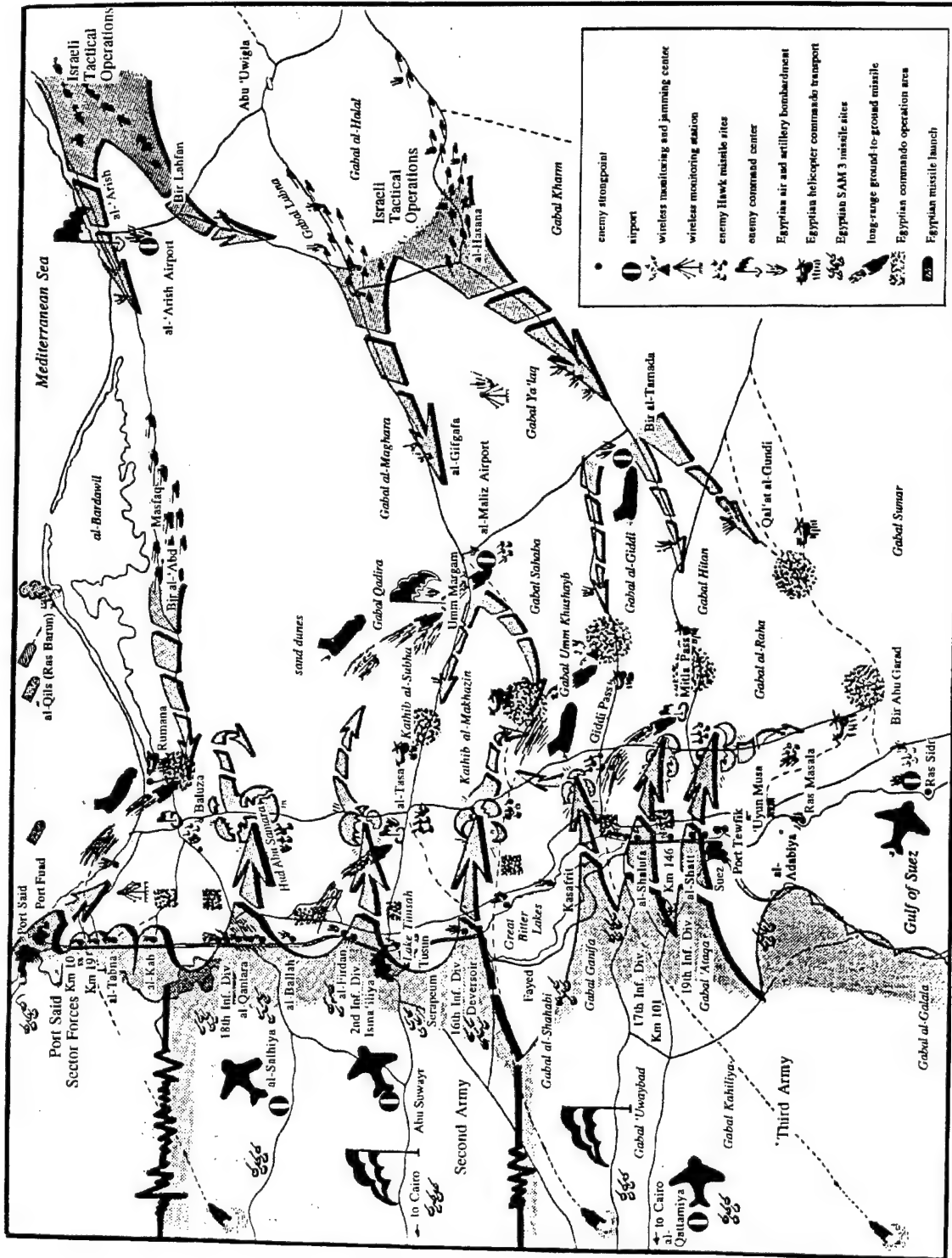
Lastly, and perhaps most importantly, none of this will occur until deliberate river crossing capability becomes a priority with maneuver commanders at all levels. They must decide that being ready to conduct these operations is an important facet of readiness within the US Army. Current evidence indicates that, despite history, readiness in this area is simply not considered a big deal.

In 1973, the Egyptians had almost perfect information on enemy defensive doctrine, capabilities, and dispositions. They had complete freedom to choose the date and time of their attack. They also knew exactly which water obstacle they would have to cross. Today's US Army must be capable of achieving a success similar to the Egyptians' without any of these advantages.

There is an old saying within the Army: "the squeaky wheel gets the grease." When it comes to deliberate river crossings, the chirp is loud. Without a major lube job, the Army would be hard pressed to get this vehicle rolling right now.



Map 1 - Rapido River Crossing Plan



Map 2 - Suez Canal Crossing P1an

Endnotes

- ¹ US Army Center for Lessons Learned. The Sava River Crossing - "Over the Sava, Sir". Fort Leavenworth: Center for Army Lessons Learned, 1996, pp. 1-4.
- ² Carl von Clausewitz. On War. Princeton: Princeton University Press, 1976, p. 441.
- ³ US Army. Field Manual (FM) 100-5, Operations. Washington, DC: US Government Printing Office, 1993, p. 1-2.
- ⁴ US Joint Chiefs of Staff, National Military Strategy of the United States of America. Washington, DC: US Government Printing Office, 1995, p. ii.
- ⁵ Charles W. Sydnor, Soldiers of Destruction. Princeton: Princeton University Press, pp. 152-187.
- ⁶ US Army, Field Manual (FM) 90-13, River Crossing Operations. Washington, DC: US Government Printing Office, 1992, p. 1-1.
- ⁷ *ibid*, p. 1-1 through 1-2.
- ⁸ *ibid*, p. 1-2
- ⁹ *ibid*, p. 3-1.
- ¹⁰ US Army, Field Manual (FM) 90-13-1, Combined Arms Breaching Operations. Washington, DC: US Government Printing Office, 1991, p. 2-1.
- ¹¹ Edwin J. Arnold. "American River Crossing Doctrine: A Look at its Compatibility With Current Force Structure and the Modern Battlefield." Fort Leavenworth, KS: US Army Command and General Staff College, 1985, p. 12.
- ¹² US Army Combat Studies Institute. CSI Battlebook 22A - Rapido River Crossing. Fort Leavenworth: US Army Command and General College, 1984, pp. 1-10.
- ¹³ Martin Blumenson. Bloody River: The Real Tragedy of the Rapido. Boston: Houghton Mifflin Company, 1970, pp. 75-76.
- ¹⁴ This information was found in the Fifth Army History, Part IV, Cassino and Anzio, 16 January 1944 to 31 March 1944, p. 40-41. See the bibliography for additional data.

¹⁵ *ibid*, p. 43.

¹⁶ Blumenson, p. 76.

¹⁷ Fifth Army History, p. 42.

¹⁸ *ibid*, p. 84.

¹⁹ Blumenson, p. 84.

²⁰ *ibid*, pp. 85-86

²¹ CSI Battlebook 22A, pp. 44-46.

²² Fifth Army History, pp. 47-48.

²³ CSI Battlebook 22A, p. 23.

²⁴ Blumenson, p. 7.

²⁵ Fifth Army History, p. 43.

²⁶ George W. Garwych, "Combat Engineering - Egyptian Engineers in the Crossing Operation of 1973" in Combined Arms in Battle Since 1939; edited by Roger J. Spiller. Fort Leavenworth: US Army Command and General Staff College, 1992, p. 44.

²⁷ Saad el Shazly, The Crossing of the Suez. San Francisco: American Mideast Research, 1980, pp. 7-9.

²⁸ Gawrych, p. 45.

²⁹ Shazly, pp. 224-225.

³⁰ *ibid*, p. 36.

³¹ Garwych, p. 47.

³² Shazly, p. 60.

³³ *ibid*, p. 222.

³⁴ Garwych, p. 48.

³⁵ Shazly, p. 226.

³⁶ *ibid*, p. 222.

³⁷ *ibid*, pp. 221-223.

³⁸ Garwych, p. 48.

³⁹ *ibid*, p. 46.

⁴⁰ According to General Shazly's account, Anwar Sadat had made many fierce statements implying threats of war toward the Israelis in the months prior to September 1973, much to General Shazly's dismay. However, Sadat's tone became much more conciliatory in the days before the war, beginning with a speech on 28 September 1973.

⁴¹ Shazly, p. 36.

⁴² *ibid*, pp. 221-235. This section of General Shazy's book contains a complete, minute-by-minute account of the first two days of the war. Except as otherwise noted, all battle accounts and descriptions come from this text.

⁴³ Much has been written and said about why the Israelis were taken unawares. This will not be debated in this essay. Suffice it to say that the Egyptians planned to surprise the Israelis and, for whatever reason, it worked.

⁴⁴ Garwych, p. 47.

⁴⁵ Shazly, p. 234.

⁴⁶ Not unexpectedly, Egyptian and Israeli estimates of losses were at odds with each other. The figures shown here are from the Egyptian Shazly.

⁴⁷ *ibid*, pp. 13-15.

⁴⁸ Chaim Herzog, The War of Atonement. Boston: Little Brown and Company, 1975, p. 159.

⁴⁹ Shazly, p. 228.

⁵⁰ *ibid*, pp. 226-227.

⁵¹ Herzog, p. 181.

⁵² Garwych, p. 48.

⁵³ Herzog, p. 166.

⁵⁴ Arnold, pp. 24-25.

⁵⁵ FM 90-13, p. 1-2.

⁵⁶ *ibid*, p. 3-1 through 3-2.

⁵⁷ *ibid*, p. 8-1.

⁵⁸ *ibid*, p. 3-4.

⁵⁹ *ibid*, p. 8-3.

⁶⁰ *ibid*, p. 8-2.

⁶¹ US Army. Field Manual (FM) 25-100, Training the Force. Washington, DC: US Government Printing Office, 1988, p. 1-3.

⁶² US Army. Engineer Unit Directory. Washington, DC: US Government Printing Office, 1995.

⁶³ The author reviewed the current MTPs for mechanized infantry at each level: platoon, company, mechanized TF, and brigade at the Combined Arms Library, Ft Leavenworth, KS on 10/28/96.

⁶⁴ The author reviewed the training objectives for BCTP Final Exercise Reports for the period 1990-1996. These documents are on file in the archives of the Center for Army Lessons Learned, Fort Leavenworth, KS.

⁶⁵ Each of the three squads in a mechanized platoon has 9 infantrymen. 3 of these (the driver, gunner, and track commander) stay with the Bradley IFV. This leaves each platoon with 18 dismounts. There are 3 platoons per company, so each company fields 54 dismounts. With 4 companies per battalion and 5 battalions in a mechanized division, the total infantry effectives number 1080.

⁶⁶ Engineer Unit Directory, p. 10-8

⁶⁷ FM 90-13, p. 3-1.

⁶⁸ FM 90-13, p. B-3.

⁶⁹ US Army, Field Manual (FM) 100-5, Operations. Washington, DC: US Government Printing Office, 1993, 2-13.

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